The Efficacy of GLP-1 RAs in Managing Weight Loss after Bariatric Surgery: A Literature Review

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Abstract:

Introduction: Obesity is becoming a global concern, with a significant rise in prevalence over the last few decades. Currently the most effective treatment for severe obesity is bariatric surgery. Unfortunately, there are some patients who have insufficient weight loss (IWL) or weight regain (WR) after surgery. Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) are effective anti-obesity medications. The purpose of this study is to evaluate the efficacy of these medications in managing weight post-bariatric surgery, including patients with IWL and WR.
Methods: A literature search was conducted on PubMed and Google Scholar and 6 articles were found which met the set inclusion criteria.
Results: Two articles explored the use of GLP-1 RAs as adjunct therapy to surgery. One article assessed their use in treating IWL. Three articles evaluated their use in managing WR.
Discussion: The articles exploring the use of these medications as adjunct therapies found opposing results likely from the difference in study design and quality. The study opposing the use of GLP-1 RAs was of low quality, supporting the conclusion that these medications are effective as adjunct therapies. The study on IWL treatment found results supporting the use of GLP-1 RAs in a specific patient population, requiring further research to see whether these conclusions apply to a more general clinical population. Finally, the three studies on WR found similar results despite having differences in design and level of variability between participants, suggesting their common conclusion is generalizable to a wide variety of clinical settings.
Conclusion: Overall, this study supports the use of these medications in managing weight after bariatric surgery.

Introduction:

Obesity has become a worldwide epidemic. From 1990 to 2021, the prevalence of obesity has increased 155.1% in males and 104.9% in females, globally (1). Unfortunately, this trend is expected to continue, with over half of the adult population worldwide or 3.80 billion people predicted to be obese by 2050 (1). This rise in prevalence is concerning due to the significant burden of disease from obesity (2). It is associated with conditions such as type 2 diabetes, heart failure, chronic kidney disease, and non-alcoholic fatty liver disease (2). Furthermore, obesity is associated with premature mortality (3). Given the significant individual and global impact of obesity, prevention and treatment are crucial.

There are various treatments for obesity. Firstly, there is lifestyle modification with changes in diet and physical activity (4). Another option is pharmacotherapy with anti-obesity medications (4). When these options are unsuccessful, bariatric surgery can be considered (4). There are a variety of different surgeries used for weight loss, including adjustable gastric-banding (AGB), Roux-en-Y gastric bypass (RYGB), and sleeve gastrectomy (SG; 4). Surgeries lead to better weight loss outcomes (5), lower mortality, and longer life expectancy (6) compared to non-surgical interventions. However, there are still limitations to bariatric surgery. Patients can have insufficient weight loss (IWL) or weight regain (WR) after bariatric surgery (7). Poor weight loss outcomes have a negative impact on patients. This includes a resurgence of obesity-related comorbidities (8), reduced quality of life (9), and the need for revisional surgery (10), which has poor perioperative outcomes (11). Therefore, there is a need for effective strategies for weight management after bariatric surgery.

There are multiple options available for managing weight after bariatric surgery. Similar to obesity management, there are lifestyle interventions such as diet changes and physical activity which can be used to prevent WR (12). Additionally, revisional surgery can be indicated in cases of IWL or WR (13). Finally, pharmacotherapy is an option for weight management post-bariatric surgery (14). Glucagon-like peptide-1 (GLP-1) receptor agonists (GLP-1 RAs) are a class of medications used to treat obesity (15). GLP-1 is an incretin hormone which delays gastric emptying (16), promotes insulin secretion and decreases glucagon secretion postprandially (17). Increased secretion of GLP-1 is one of the mechanisms behind weight loss from bariatric surgery (18). High levels of GLP-1 have been associated with better weight loss outcomes from surgery (18). This raises the question of whether the use of GLP-1 RAs after bariatric surgery, can improve weight loss outcomes.

The purpose of this study is to explore the efficacy of GLP-1 RAs in weight management after bariatric surgery. The study will assess the use of GLP-1 RAs as an adjunct therapy to surgery to optimize weight loss. The study will also investigate the use of these medications to treat IWL and WR. Like every medical intervention, bariatric surgery has limitations (7) which can negatively impact patients. Understanding the efficacy of GLP-1 RAs in managing weight after surgery can allow healthcare providers to better support patient's health and quality of life after surgery.

Methods:

Inclusion Criteria:

An inclusion criterion was determined prior to the search to ensure the most relevant sources were used in this study. The papers needed to be primary research and in English. They needed to either assess the use of GLP-1 RAs as adjunct therapies to optimize weight loss from bariatric surgery or their use in patients with IWL or WR after surgery. The scope was narrowed to the use of these medications after three common bariatric surgeries, AGB, RYGB and SG.

Search Strategy:

A search was conducted on PubMed in March 2025 and on Google Scholar in January 2025. On PubMed, the MeSH term “bariatric surgery” was combined with key words such as “glucagon-like peptide-1 receptor agonists”, “GLP-1 RA” and the two types of these medications approved for obesity management in Canada (19). The final search was: "bariatric surgery"[MeSH Terms] AND ("glucagon-like peptide-1 receptor agonists" OR "GLP-1 RA" OR liraglutide OR semaglutide). This produced 220 results. A publication year range of 2015 to 2025, and the filters of “clinical trial” and “randomized controlled trial” were applied to find primary research. This resulted in 11 papers. The titles and abstracts of these papers were assessed using the inclusion criteria described above and 5 papers were selected. On Google Scholar, similar keywords were used, including “glucagon-like peptide-1 receptor agonists”, “GLP-1 RA” and different types of GLP-1 RAs. The final search was: ("glucagon-like peptide-1 receptor agonists" OR "GLP-1 RA" OR semaglutide or liraglutide) AND ("bariatric surgery"). This produced 5540 results. With a publication year range of 2015-2025, the total number of results was 5260. Due to the great number of results and because Google Scholar orders results based on relevance to the search, the titles and abstracts of the first 20 results were examined. 1 relevant article was selected which met the inclusion criteria and was not already found during the PubMed search. This resulted in a total of 6 studies for this paper.

Results:

The purpose of this study was to evaluate the efficacy of GLP-1 RAs in weight management after bariatric surgery. 6 studies were analyzed to meet this objective and are summarized in Table 1 (Appendix). These studies varied in multiple ways. Coelho et al. and Hany et al. focused on the use of these medications as an adjunct therapy to optimize weight loss from surgery (20, 21). Mok et al. evaluated their use to treat patients who had IWL after surgery (22). Jensen et al., Murvelashvili et al., and Lofton et al. assessed the efficacy of GLP-1 RAs in treating WR after bariatric surgery (23-25). Jensen et al. and Murvelashvili et al. were retrospective studies (23, 24), while the rest were double-blind randomized placebo-controlled trials (20-22, 25). Sample sizes ranged from 27 (20) to 207 (24). The type of surgeries patients underwent varied between studies, including AGB (20, 23, 24), RYGB (21-25) and SG (22-24). Jensen et al. and Murvelashvili et al. studied semaglutide and liraglutide (23, 24), while the others only studied liraglutide (20-22, 25). There was variation in the dosing of medications, including 1.8 mg (20, 23) or 3.0 mg (21-25) subcutaneous daily for liraglutide, and 1.0 mg subcutaneous weekly (23, 24) or 14.0 mg oral daily (23) for semaglutide. Treatment duration ranged from 6 months (20-23) to 56 weeks (25), with end-points measured until maximum 56 weeks from the start of treatment (25). The common weight-related outcome between all studies was % change in body weight (% ΔBW; 20, 22, 24) or % total weight loss (% TWL; 21, 23, 25), which are equivalent values.

GLP-1 RAs as an Adjunct Therapy to Bariatric Surgery:

Different types of bariatric surgeries vary in their efficacy in managing weight loss. For example, laparoscopic adjustable gastric banding (LAGB) has poorer weight loss outcomes compared to RYGB (26). Coelho et al. were interested in assessing whether treatment with GLP-1 RAs could optimize weight loss and glycemic management from LAGB (20). They conducted a double-blind randomized controlled trial (20). Participants received either 1.8 mg liraglutide (n = 13) or placebo (n = 14) subcutaneous daily starting within 6 weeks of undergoing LAGB, for 6 months, and with an additional 6 months of follow-up (20). Multiple weight-related outcomes were measured at 3, 6, 9 and 12 months (20). Univariate and multivariate analyses showed no difference in % ΔBW between treatment groups at all time points (20). Univariate analyses showed no significant difference in body weight between groups at all time points (20). Multivariate analyses showed no difference in body weight between groups at 3, 6 and 9 months, but at 12 months, body weight was significantly higher in the liraglutide group (20). A total of 42 adverse effects were documented, 32 in liraglutide and 10 in placebo, and 27 of which were gastrointestinal (20). There was no significant difference in adverse effects between groups (20). The study concluded that the use of liraglutide after LAGB did not produce better weight loss compared to LAGB alone (20).

Conversional RYGB (cRYGB), a surgery which is commonly done when laparoscopic sleeve gastrectomy (LSG) is unsuccessful, has been found to have poor weight loss compared to primary surgery (27). Hany et al. conducted a study that explored the use of GLP-1 RAs to enhance weight loss after cRYGB (21). This study was a double-blind randomized controlled trial, with 3.0 mg liraglutide (n = 40) or placebo (n = 40) subcutaneous daily, starting at 6 weeks post-cRYGB, for 6 months, and followed-up for an additional 6 months (21). All participants were also on a 500-kcal energy deficit daily (21). Weight-related endpoints were measured at 1 month, 6 weeks, 6 months, and 12 months (21). They found significantly higher % TWL in the liraglutide group compared to the placebo group at all time points (21). A total of 11 adverse events were documented, most of which were gastrointestinal and all were seen in the liraglutide group (21). They concluded that there is higher weight loss from cRYGB when combined with liraglutide than just surgery alone (21).

GLP-1 RAs to Treat IWL after Bariatric Surgery:

Although bariatric surgery is grossly effective in managing obesity, there is a significant proportion of patients who have IWL after surgery (7). Mok et al. conducted a double-blind randomized controlled trial to study the effect of liraglutide treatment on patients who had IWL after bariatric surgery (22). They recruited patients at least 1 year from RYGB or SG, had 20% or less total body weight loss from the day of surgery, and had a suboptimal GLP-1 response defined as 2-fold or less increase in active GLP-1 from fasting to 30 minutes after a meal (22). They received either 3.0 mg liraglutide (n = 35) or placebo (n = 35) subcutaneous daily for 6 months with a 500-kcal energy deficit daily and encouragement to get 150 minutes of moderate to vigorous exercise weekly, followed by a 4-week follow-up (22). They measured % ΔBW from baseline to the end of the 6-month treatment period (22). They found % ΔBW, specifically decrease in body weight, to be significantly higher with liraglutide compared to placebo (22).

They found a total of 48 adverse effects, mainly gastrointestinal, 28 in the liraglutide group and 20 in the placebo group (22). They concluded that liraglutide is an effective treatment for IWL after bariatric surgery (22).

GLP-1 RAs to Treat WR after Bariatric Surgery:

Some patients can experience WR after bariatric surgery (7). Jensen et al. conducted a retrospective observational study to assess the use of liraglutide and semaglutide in managing WR in patients (23). The participants in the study had undergone one or two surgeries such as proximal RYGB, distal RYGB, SG and AGB (23). Patients who had regained any amount of weight after reaching nadir weight at least 12 months after surgery, were included (23). In general, at baseline, 72 weeks after the last bariatric surgery, patients had 15.1% increase in total body weight (23). Dosing of liraglutide was 3.0 mg (n = 28) or 1.8 mg (n = 1) subcutaneous daily (23). Dosing of semaglutide was 1.0 mg subcutaneous weekly (n = 20) or 14.0 mg oral daily (n = 1; 23). The minimum time between surgery and start of GLP-1 RA treatment was 12 months based on the definition for WR (23). They received the GLP-1 RA for 6 months (23). After GLP-1 RA treatment, they had a % TWL of 8.8% (23). Weight loss was significantly higher with semaglutide than liraglutide (23). They also conducted sensitivity analysis to see if certain factors had an influence on the effect of liraglutide on weight (23). They found GLP-1 RA treatment initiated 72 months or more after surgery led to higher weight loss, but not statistically significant (23). Other factors such as diabetes diagnosis, sex, age, variability in WR, presence of a physical cause for WR, and self-payer status of a participant did not affect weight loss seen from GLP-1 RAs (23). Adverse effects were found in 36% of patients, mainly gastrointestinal (23). They concluded that GLP-1 RAs, semaglutide more than liraglutide, are a good therapeutic option for treating WR after bariatric surgery (23).

Murvelashvili et al. conducted a retrospective analysis to explore the use of semaglutide and liraglutide to treat WR after bariatric surgery (24). Patients had undergone a variety of surgeries, including vertical SG, RYGB, and AGB (24). The study included patients who had reached out for treatment for any level of weight regain after bariatric surgery (24). On average, 42.43% of the weight which was lost, was regained (24). Patients who had received either 1.0 mg semaglutide subcutaneous weekly (n = 115) or 3.0 mg liraglutide subcutaneous daily (n = 92) for 12 months, were included (24). The study did not have a set criteria for time that needed to pass between surgery and start of GLP-1 RA treatment (24). The % ΔBW at 12 months was significantly higher with semaglutide than liraglutide (24). The superiority of semaglutide compared to liraglutide was seen in subgroup analyses of age, sex, race and type of surgery (24). In general, they found that GLP-1 RAs effectively manage WR and semaglutide is better than liraglutide for this (24).

Lofton et al. also studied WR management with GLP-1 RAs (25). They conducted a double-blind randomized controlled trial with patients who had gained weight after RYGB (25). Patients were 18-120 months out from RYGB, had ≥25% TWL after surgery and regained ≥10% TWL after reaching their nadir weight (25). They received either 3.0 mg liraglutide (n = 89) or placebo (n = 43) subcutaneous daily for 56 weeks, along with 500-kcal energy deficit daily and encouragement to exercise (25). The % TWL at 3, 6, 9 and 12 months of treatment was significantly higher with liraglutide compared to placebo (25). 41.6% of participants taking liraglutide had non-serious adverse effects, the majority of which were gastrointestinal (25). Serious adverse effects were more common in the placebo group (25). They concluded that liraglutide was effective at treating WR after RYGB (25).

Discussion:

GLP-1 RAs Optimize Weight Loss when Used as an Adjunct Therapy to Bariatric Surgery:

Coelho et al. and Hany et al. had different conclusions on the use of liraglutide as an adjunct therapy to bariatric surgery (20, 21). The studies were similar in multiple ways. They both were double-blind randomized placebo-controlled trials (20, 21). They compared liraglutide to placebo, starting a maximum of 6 weeks after bariatric surgery, for a treatment period of 6 months and an additional 6-month follow-up (20, 21). They measured similar weight loss outcomes such as % ΔBW or % TWL (20, 21). But there were also differences in the studies which could explain the incongruence in results. Firstly, participants in Hany et al. received a higher dose of liraglutide (21) compared to those in Coelho et al. (20). The 3.0 mg dose of liraglutide in Hany et al. (21) has been found to produce better weight loss (28) compared to the 1.8 mg dose in Coelho et al (20). While there was superior weight loss seen in Hany et al. (21), there were similar gastrointestinal adverse effects seen in both studies (20, 21). This indicates patients would benefit from the 3.0 mg dose rather than 1.8 mg dose in clinical practice. Another difference is patients in the Hany et al. study underwent a calorie deficit along with liraglutide or placebo treatment (21). Research has shown increased long term weight loss when lifestyle interventions are combined with GLP-1 RA treatment (29). Therefore, the calorie deficit in Hany et al. (21) could have enhanced the weight loss effect of liraglutide resulting in the difference between treatment groups which was not seen in Coelho et al. (20). This suggests patients could benefit from a combination of dietary changes and pharmacotherapy to enhance weight loss from bariatric surgery. The participants in both studies also underwent different bariatric surgeries. Participants in Coelho et al. underwent primary surgery with LAGB (20) and those in Hany et al. underwent revisional surgery where LSG was converted to RYGB (21). Studies have found that RYGB causes superior weight loss compared to LAGB (30) which could explain the difference in findings. But studies have also shown better weight loss with primary surgery compared to revisional surgery (31) which does not align with the findings in the studies, suggesting other factors, such as those discussed above, are at play. Therefore, these multiple differences between the studies could explain the inconsistency in results.

Most research has shown that liraglutide enhances weight loss in patients (32). Hany et al. found results aligning with this consensus (21) while Coelho et al. found results opposing this trend (20). Although Coelho et al. was a well-designed study with blinding and randomization, there were complications in execution of the study which reduced the quality of the results they found (20). One large limitation was an inadequate sample size (20). The study aimed for a target sample size of 58 to be able to detect significant differences between groups in primary and secondary endpoints (20). But in reality, only 27 participants were included in this study (20). With less than 50% of the target sample size met (20), the quality of conclusions from this study is reduced. Another limitation of Coelho et al. was missing data on participants (20). 6 out of 12 participants receiving liraglutide and 6 out of 13 participants receiving placebo had missing data for secondary outcomes, including weight-related outcomes (20). Missing information can change the trend seen in results. The combination of few participants in the study and missing data on these participants (20) significantly reduced the quality of the conclusion drawn. Therefore, the conclusion that liraglutide is a beneficial adjunct therapy to optimize weight loss from bariatric surgery, found by Hany et al. (21), is more reliable.

GLP-1 RAs are Effective in Treating IWL after Bariatric Surgery:

Mok et al. was the only study found in our search pertaining to GLP-1 RA use in managing IWL after bariatric surgery (22). This study was well designed with blinding and randomization (22), adding to the quality of the research. The study also had specific criteria for IWL and poor GLP-1 response (22). Only participants who met these criteria were recruited which reduces the heterogeneity in participants which can sway results. However, it is important to consider that in clinical practice not every patient with IWL will fall into this definition. No unified definition of IWL has been established, instead there are multiple different definitions in the literature (33). The findings from Mok et al. would not be generalizable to a patient diagnosed with IWL with a definition different from that in the study. Additionally, there could be patients presenting for care who have optimal GLP-1 responses but still have IWL. Low GLP-1 after bariatric surgery is one of the mechanisms behind weight loss failure (18) but there are also other mechanisms that could be at play, for example low levels of peptide YY (34). More studies focused on IWL on a broader population of patients should be conducted and analyzed to get a better understanding of how GLP-1 RAs work in managing IWL in clinical practice. However, this study provides strong preliminary data supporting the use of liraglutide to treat IWL in this specific patient population (22).

GLP-1 RAs are Beneficial in the Management of WR after Bariatric Surgery:

Jensen et al., Murvelashvili et al., and Lofton et al. aimed to explore the use of GLP-1 RAs to manage WR in patients after bariatric surgery (23-25). All the studies found the same result of significant weight loss with GLP-1 RA treatment in this patient population (23-25), despite differences in study design. Jensen et al. and Murvelashvili et al. had similar study designs (23, 24). They both were retrospective studies (23, 24). This study design is beneficial as it allows a larger sample size to be recruited (35) as seen in Murvelashvili et al. which had a sample size of 207 (24), the largest of all three studies. This reduces the chances of random error which can affect the results found (36). However, this study design does not involve blinding or randomization which increases the risk of selection bias, reducing the internal validity of the study (37). Both these studies also had a lot of heterogeneity in participants because of their broad inclusion criteria (23, 24). Jensen et al. included patients who underwent a variety of types and numbers of bariatric surgeries, had any level of WR after nadir weight at least 12 months after surgery, and who started treatment any time at least 12 months after surgery (23). Murvelashvili et al. also included patients who underwent a variety of bariatric surgeries, had any level of WR and started GLP-1 RA treatment any time after surgery, once they qualified for it (24). This can introduce multiple confounding variables which can affect the results found in the study. However, it also represents clinical practice where patients at different points in their weight loss journey will present for care. The conclusion that GLP-1 RAs manage weight effectively in such a broad population of patients in two studies (23, 24), shows their strong potential for therapeutic use. Jensen et al. also accounted for this heterogeneity by conducting a sensitivity analysis to show whether differences in participant characteristics affected the results found (23), reducing the impact of the variability between participants. Both these studies compared weight loss seen with semaglutide and liraglutide in patients with WR after surgery (23, 24). They both found that semaglutide is more effective than liraglutide in weight management at 12 months (23, 24). This finding is significant as it encourages practitioners to prescribe semaglutide which will produce more optimal weight loss and better adherence due to its lower dosing frequency (38). These studies did have some differences as well. One difference was how weight loss after the GLP-1 RA treatment period was defined (23, 24). Murvelashvili et al. defined weight loss at the end of the 12-month treatment period to be the maximum weight loss achieved at any time point during treatment (24), while Jensen et al. defined it as the weight loss measured at the end of the 6-month treatment period (23). The definition used by Murvelashvili et al. is a limitation of the study as it can over-call the level of weight loss seen and can hide obscure cases where weight did not change or possibly increased by 12 months of GLP-1 RA treatment. But in general, both these studies had good study designs with broad inclusion criteria and evaluation of two types of GLP-1 RAs. The study by Lofton et al. differed in design from the other studies. This study was a double-blind randomized controlled trial (25). With this type of study, they were able to overcome the risk of selection bias which can exist with retrospective studies (37). They also had a narrower inclusion criterion for participants with more specific definitions for level of weight loss and then WR after surgery (25). This reduces the effect of variation in WR on GLP-1 RA efficacy. But similar to the other studies it did have wide variability in time between surgery and start of treatment (25). This study has its own limitations as well. One of which is they used 2:1 randomization for liraglutide:placebo to increase recruitment to the study (25). This type of randomization can create a picture of superiority (39) for the liraglutide group, possibly indirectly affecting the efficacy of this treatment. Overall, all these studies provide important contributions to the understanding of

GLP-1 RA use in WR, with Lofton et al. providing important research on a more specific patient population (25) and Jensen et al. and Murvelashvili et al. generating conclusions that are more generalizable (23, 24). The consistent conclusion found in all these studies, despite differences in design, is promising for the efficacy of these drugs in treating WR.

Limitations:

This study has multiple limitations. Firstly, despite a total of 6 papers included in this literature review, a limited number are used to explore each objective of the study. For example, there is only one paper used to assess the use of GLP-1 RAs to manage IWL after bariatric surgery (22). There are two papers to explore the use of GLP-1 RAs as adjunct therapies to commonly sub-optimal surgeries (20, 21), but one of them has significantly lower sample size than needed to detect significance (20). With limited studies it is difficult to assess consistency of results across research. Another limitation to this study is the heterogeneity between the studies included in this literature review. They vary in sample size, surgeries patients underwent, time between surgery and start of pharmacotherapy, dosing of GLP-1 RAs, and duration of GLP-1 RA treatment. Although this makes it difficult to compare the studies, finding similar conclusions between studies shows promise of the efficacy of GLP-1 RAs in managing weight in a wide variety of patients in clinical practice. Another limitation is this study mainly focuses on liraglutide (20-25), with two studies also focusing on semaglutide (23, 24). There are other GLP-1 RAs which have been found to be effective in managing weight (40). However, currently in Canada only semaglutide and liraglutide are approved for weight loss (19). There are also other anti-obesity medications such as tirzepatide (41) which could also be used in these patients and can be assessed in future studies. Finally, the main measures of efficacy used in this study were weight-related outcomes, but the true reason for managing weight is to avoid comorbidities such as diabetes, heart failure, and kidney dysfunction (2). Therefore, it is not just weight that matters but rather the conditions which can be prevented when weight is managed.

Future Directions:

Although this study met its purpose of exploring GLP-1 RA use for weight management after bariatric surgery, there are still further steps which can be taken. Future studies can be conducted to assess how the weight loss seen with GLP-1 RAs after bariatric surgery, can influence the incidence of obesity-related comorbidities. This is important as the final goal of undergoing bariatric surgery and maintaining healthy weight is to avoid the development or worsening of these comorbidities. This study also only looked at liraglutide (20-25) and semaglutide (23-24), but future studies can assess the use of other anti-obesity medications such as tirzepatide (41) after bariatric surgery. Having broad knowledge about a variety of medications gives healthcare providers a large array of treatment options they can use to treat their patients. Additionally, this literature review only uses papers in which patients were followed for a maximum of 56 weeks (25). Longer term studies can be assessed to see whether these optimal weight loss outcomes remain past this time frame. Finally, Jensen et al. did find with a sensitivity analysis that weight loss outcomes were more optimal when GLP-1 RA therapy was started ≥72 months after surgery, but this finding was not statistically significant (23). It would be beneficial to get a clear timeline on when to start GLP-1 RAs after bariatric surgery to get the most optimal results.

Conclusion:

This literature review supports the use of GLP-1 RAs in managing weight after bariatric surgery. Although both studies evaluating the use of these medications as adjuncts to surgery found opposing results (20, 21), the significant limitations of one study (20) reinforce the conclusion that these medications can optimize weight after surgery. One study showed significant weight loss in patients with IWL after bariatric surgery, using GLP-1 RAs, in a specific patient population (22). Further studies exploring this in a more general population of patients can strengthen this conclusion. Finally, three studies explored the use of these medications in managing WR after surgery (23-25). One study showed weight loss in a more specific patient population (25), while the other two had wide heterogeneity in their patient population (23, 24) mimicking the efficacy of these medications when used in clinical practice. Consistency in results, despite differences in studies shows the strong potential of GLP1-RAs in treating WR. Overall, this study found that GLP-1 RAs are effective in optimizing and maintaining good weight outcomes after bariatric surgery.

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Appendix:

Table 1. Summary of the six articles analyzed in this literature review.

	Coelho et al. (20)	Hany et al. (21)	Mok et al. (22)	Jensen et al. (23)	Murvelashvili et al. (24)	Lofton et al. (25)
Type of Study	Randomized controlled trial	Randomized controlled trial	Randomized controlled trial	Retrospective observational study	Retrospective analysis	Randomized controlled trial
Role of GLP-1 RA after Bariatric Surgery	Adjunct therapy	Adjunct therapy	Treating IWL	Treating WR	Treating WR	Treating WR
Sample size	27	80	70	50	207	132
Type of Bariatric Surgery Participants Underwent	LAGB	cRYGB	RYGB, SG	1 or 2 surgeries ex. proximal RYGB, distal RYGB, SG, AGB	SG, RYGB, AGB	RYGB
Criteria for IWL or WR			IWL = 20% or less total body weight loss from the day of surgery	WR = any amount of weight regained after reaching nadir weight at least 12 months after surgery	WR = any amount of weight regain, no criteria specified	WR = regained ≥10% total body weight loss from surgery after reaching their nadir weight
Time between Surgery and GLP-1 RA Initiation	≤ 6 weeks	6 weeks	≥ 1 year	≥ 1 year based on WR definition	Any amount of time, no time frame specified	18-120 months
Primary Interventions	1.8 mg liraglutide subcutaneous daily OR placebo	3.0 mg liraglutide subcutaneous daily OR placebo	3.0 mg liraglutide subcutaneous daily OR placebo	3.0 mg liraglutide subcutaneous daily/ 1.8 mg liraglutide subcutaneous daily OR 1.0 mg semaglutide subcutaneous weekly/ 14.0 mg semaglutide oral daily	3.0 mg liraglutide subcutaneous daily OR 1.0 mg semaglutide subcutaneous weekly	3.0 mg liraglutide subcutaneous daily OR placebo
Additional Interventions		500 kcal energy deficit daily	500 kcal energy deficit daily + encouraged to do 150 minutes			500 kcal energy deficit daily + encouraged to do 150 minutes

			of exercise weekly			of exercise weekly
Intervention Duration	6 months	6 months	6 months	6 months	12 months	56 weeks
Duration of Additional Follow-Up after Interventions Complete	6 months	6 months	4 weeks			
Primary conclusion	The use of liraglutide as an adjunct therapy to LAGB does not produce better weight loss compared to surgery alone.	The use of liraglutide as an adjunct therapy to cRYGB produces better weight loss compared to surgery alone.	Liraglutide is an effective treatment for insufficient weight loss after bariatric surgery.	Liraglutide and semaglutide are effective treatments for weight regain after bariatric surgery, with semaglutide being more superior to liraglutide.	Liraglutide and semaglutide are effective treatments for weight regain after bariatric surgery, with semaglutide being more superior to liraglutide.	Liraglutide is an effective treatment for weight regain after RYGB.